110. (New) A microwave plasma processing method according to claim 108, wherein adjacent slots of said plurality of slots are at a spacing of one half or one quarter of a guide wavelength of microwaves in said annular waveguide.

REMARKS

I. Substitute Declaration

An executed Substitute Reissue Declaration is enclosed herewith, as required by the Examiner. A Statement Under 37 C.F.R. § 3.73(b) and an Offer to Surrender Letters Patent, executed by the assignee, will be provided shortly. Applicants respectfully request that the requirement for these documents be held in abeyance until they can be obtained.

II. Substitute Specification

Enclosed herewith is a substitute specification in which the Certificate of Correction changes have been inserted, without bracketing or underlining, as required by the Examiner. The enclosed substitute specification includes four minor corrections shown on the attached mark-up (col. 8, line 54, col. 10, line 36, col. 16, line 13, and col. 25, line 7 of the issued patent; pages 14, 16, 26 and 41 of the substitute specification). Applicants note that a substitute specification is not ordinarily permitted in a reissue application (37 C.F.R. § 1.125(d), but that the substitute specification is being provided at the request of the Patent and Trademark Office. The undersigned certifies that no new matter has been added.

III. Status of the Claims

Upon entry of the foregoing amendment, claims 1-110 are pending in the application. Claims 1, 10, 19, 26, 38, 50, 60, 68, 78, and 86 are independent claims. Applicants gratefully acknowledge the indication of allowable subject matter in claims 1-18 and 26-49. Claims 19, 50, 60, 68, 78, and 86 have been amended in substantially identical fashion to better define the invention. Dependent claims 99-110, directed to the spacing of slots on the wave guide, have been added. No new matter has been added.

Support for the amendment can be found in the specification, claims and drawings as originally filed. The issued patent, No. 5,803,975, discloses that microwaves are irradiated through the plurality of slots (see Figures 6 and 8, for example), as recited in all of the amended claims. As noted in the patent at col. 8, lines 4-8, and as presently claimed, the microwaves propagating through the wave guide having the claimed dielectric material therein have a shortened wavelength (as compared to what they would have in the absence of the dielectric material).

New claims 99-110 are directed to the close spacing of the slots, which results in a highly dense, uniform plasma. Support for this subject matter is found throughout the patent disclosure, at least at col. 7, lines 48-58, at col. 8, lines 8-12, and at col. 11, line 9 to col. 12, line 6.

IV. Rejections Under 35 U.S.C. § 103(a)

Claims 19-25, and 50-98 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over JP 7-90591 (Suzuki), in view of JP 5-62796 (Inoue) and JP 7-263186 (Watanabe). Applicants respectfully traverse.

The provision of a dielectric material in an endless annular wave guide having a plurality of slots is not found in the prior art, and nothing in any of the references

cited would have made such a combination obvious. In fact, as described below, the structures shown in the prior art would not operate in their intended manner if the combination asserted by the Examiner were made.

As described in the specification at col. 7, line 67 to col. 8, line 12, providing the dielectric material in the annular waveguide shortens the wavelength of microwaves propagating in the wave guide. Consequently, a smaller spacing between slots is permitted, resulting in more irradiating sites, and therefore a more uniform and higher density plasma.

As amended, the claims set forth more clearly these important features of the claimed apparatus and method. Specifically, each of claims 19, 50, 60, 68, 78 and 86 recites that the dielectric in the annular wave guide shortens the wavelength of the microwaves propagating in the wave guide. Each of claims 19, 50, 60, 68, 78 and 86 further recites that the slots have microwaves radiating through them during operation of the apparatus. The recited combination permits more uniform, higher density microwave radiation to be achieved by the claimed method and apparatus.

Dependent claims 99-110 set forth the closer spacing of the slots. When referring to the spacing between slots, claims 99-110 recite that at least selected slots are spaced at ½ guide wavelength intervals. It will be apparent that where adjacent slots are placed at ⅛ guide wavelength intervals, each fourth slot would be at a ½ guide wavelength interval. Likewise, where adjacent slots are placed at ¼ guide wavelength intervals, each second slot is at a ½ wavelength spacing. Claims 99, 101, 103, 105, 107 and 109 recite the spacing broadly. Claims 100, 102, 104, 106, 108, and 110 recite the embodiments where adjacent slots are at ¼, or ½ wavelength spacing.

A rejection under 35 U.S.C. § 103(a) must incorporate a determination of the scope and content of the prior art, the differences between the prior art and the claimed invention, and the level of skill in the art. Graham v. John Deere Co., 383 U.S. 1, 17 (1966). Secondary indicia of nonobviousness, such as commercial success, long-felt need, failure by others and copying are also considered. B.F. Goodrich Co. v. Aicraft Braking Systems Corp., 72 F.3d 1577, 1582 (Fed. Cir. 1996).

Turning to the scope and content of the prior art, the Examiner relies on the overall structure of Suzuki, which shows a plasma processing apparatus including an annular wave guide with a plurality of slots for radiating microwaves. The Office Action asserts that Suzuki "does not expressly disclose that the interior of the wave guide is filled with a second dielectric material." Indeed, this is an understatement. Suzuki is directed to emitting a gas together with microwaves through a plurality of slots. Blocking the slots with dielectric would render the disclosed apparatus inoperative for the intended purpose. Applicants submit that Suzuki does not disclose a dielectric material in the claimed context and could not be adapted in the manner suggested by the Examiner. Certainly, such a modification would not be "obvious."

The Office Action asserts that the dielectric missing from Suzuki could be adapted from the other cited references, Inoue and Watanabe. However, the two secondary references are not directed to the use of a plasma processing device with an annular wave guide. Consequently, there is no motivation to combine the elements of either Inoue or Watanabe with Suzuki. In fact, it is not at all clear that the combination asserted by the Examiner would have the results suggested by the Examiner.

Watanabe, for example, uses a dielectric material to reduce the size of a microwave transmission section, which is not the same problem as irradiating microwaves through the claimed slots. Thus there is no motivation to use a dielectric in combination with the plurality of slots as presently claimed. Likewise, Inoue, uses a dielectric to achieve a uniform distribution of plasma, but there is no disclosure regarding the consequences of combining a dielectric with an annular wave guide having a plurality of slots, a central combination of each of the present independent claims. Likewise, there is no disclosure of providing the multiple irradiation sites through the slots. Thus, it is not clear why the combination asserted in the Office Action would be expected to achieve the results suggested.

The law is very clear that a rejection under 35 U.S.C. § 103 must find specific motivation for the combination made. See In re Werner Kotzab, 217 F.3d 1365, 1371, 55 U.S.P.Q.2d 1313, 1317 (Fed. Cir. 2000) ("[A] rejection cannot be predicated on the mere identification . . . of individual components of claimed limitations. Rather particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed.") Applicants respectfully submit that the disclosures of Inoue, Watanabe and Suzuki are not related, and that one of ordinary skill in the art would not find the claimed invention obvious in view of those references.

For at least the foregoing reasons Applicants submit that all of the pending claims are patentable over the prior art cited and respectfully request that the Examiner indicate allowable subject matter in all of the pending claims.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,

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Pending Claims 8-28-01 35C.11969 Application No. 09/657,971 GAU 1763

1. (Pending) A microwave plasma processing apparatus comprising:

a plasma generation chamber whose periphery is separated from ambient air by a dielectric member;

microwave introduction means utilizing an endless annular wave guide tube provided around said plasma generation chamber and having plural slots;

a processing chamber connected to said plasma generation chamber;

support means for a substrate to be processed, provided in said processing chamber;

gas introduction means for said plasma generation chamber and said processing chamber; and

evacuation means for said plasma generation chamber and said processing chamber;

wherein a circumferential length L_g of said endless annular wave guide tube, a wavelength λ_g of the microwave in said endless annular wave guide tube, a circumferential length L_s of said dielectric member and a wavelength λ_s of the surface wave propagating in said dielectric member substantially satisfy a relationship:

$$L_s/\lambda_s = (2n + 1)L_g/\lambda_g$$

wherein n is 0 or a natural number.

2. (Pending) A microwave processing apparatus according to claim 1, further comprising magnetic field generation means.

3. (Pending) A microwave processing apparatus according to claim 2, wherein said magnetic field generation means is adapted to control the magnetic field in the vicinity of the slots at a magnetic flux density approximately equal to 3.57×10^{-11} (T/Hz) times of a frequency of the microwave.

4. (Pending) A microwave processing apparatus according to claim 1, wherein said substrate support means is provided at a position distant from a generation area of said plasma.

5. (Pending) A microwave processing apparatus according to claim 1, further comprising means for irradiating the substrate to be processed with optical energy.

6. (Pending) A microwave processing apparatus according to claim 5, wherein said optical energy includes ultraviolet light.

7. (Pending) A microwave processing apparatus according to claim 1, further comprising high frequency supply means connected to said support means.

8. (Pending) A microwave processing apparatus according to claim 1, wherein said wave guide tube is provided therein with a dielectric material.

9. (Pending) A microwave processing apparatus according to claim 1, wherein said wave guide tube is provided therein with a dielectric material which is different from said dielectric member.

10. (Pending) A microwave plasma processing apparatus comprising:

a plasma generation chamber whose periphery is separated from ambient air by a dielectric member;

microwave introduction means utilizing an endless annular wave guide tube provided around said plasma generation chamber and having plural slots;

a processing chamber connected to said plasma generation chamber;

support means for a substrate to be processed, provided in said processing chamber;

gas introduction means for said plasma generation chamber and said processing chamber; and

evacuation means for said plasma generation chamber and said processing chamber;

wherein a central radius R_g of said endless annular wave guide tube, a wavelength λ_g of the microwave in said endless annular wave guide tube, a central radius R_s of the

dielectric member and a wavelength λ_s of the surface wave propagating in said dielectric member substantially satisfy a relationship:

$R_s/\lambda_s=(2n+1)R_g/\lambda_g$

wherein n is 0 or a natural number.

11. (Pending) A microwave processing apparatus according to claim 10, further comprising a magnetic field generation means.

12. (Pending) A microwave processing apparatus according to claim 11, wherein said magnetic field generation means is adapted to control the magnetic field in the vicinity of the slots at a magnetic flux density approximately equal to 3.57×10^{-11} (T/Hz) times of a frequency of the microwave.

13. (Pending) A microwave processing apparatus according to claim 10, wherein said substrate support means is so provided as to place the substrate at a position distant from a generation area of said plasma.

14. (Pending) A microwave processing apparatus according to claim 10, further comprising means for irradiating the substrate to be processed with optical energy.

15. (Pending) A microwave processing apparatus according to claim 14, wherein said optical energy includes ultraviolet light.

16. (Pending) A microwave processing apparatus according to claim 10, further comprising high frequency supply means connected to said support means.

17. (Pending) A microwave processing apparatus according to claim 10, wherein said wave guide tube is provided therein with a dielectric material.

18. (Pending) A microwave processing apparatus according to claim 10, wherein said wave guide tube is provided therein with a dielectric material which is different from said dielectric member.

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19. (Amended) A microwave plasma processing apparatus comprising:

a plasma generation chamber provided with a first dielectric material;

a processing chamber connected to said plasma generation chamber;

means for supporting a substrate to be processed, provided in said processing chamber;

microwave introduction means utilizing an endless annular wave guide with a plurality of slots for radiating microwaves therethrough provided outside of said first dielectric material;

means for introducing gas for said plasma generation chamber and said processing chamber; and

evacuation means for said plasma generation chamber and said processing chamber;

wherein an interior of said annular wave guide tube is filled with a second dielectric material which is the same as or different from said first dielectric material so that the wavelength of microwaves in said wave guide is shortened.

20. (Pending) A microwave processing apparatus according to claim 19, wherein a ratio of dielectric constants of said first and second dielectric materials is approximately equal to a reciprocal of a square of the ratio of circumferential lengths of said first and second dielectric materials.

21. (Pending) A microwave processing apparatus according to claim 19, further comprising a magnetic field generation means.

22. (Pending) A microwave processing apparatus according to claim 21, wherein the magnetic field in the vicinity of the slots has a magnetic flux density approximately equal to 3.57×10^{-11} (T/Hz) times of a frequency of the microwave.

23. (Pending) A microwave processing apparatus according to claim 19, wherein said substrate support means is provided at a position distant from a generation area of said plasma.

24. (Pending) A microwave processing apparatus according to claim 19, further comprising means for irradiating the substrate to be processed with optical energy.

25. (Pending) A microwave processing apparatus according to claim 19, further comprising high frequency supply means connected to said support means.

26. (Pending) A microwave plasma processing method utilizing a microwave plasma processing apparatus comprising a plasma generation chamber whose periphery is separated from ambient air by a dielectric member; microwave introduction means utilizing an endless annular wave guide tube provided around said plasma generation chamber and provided with plural slots; a processing chamber connected to said plasma generation chamber; support means for a substrate to be processed, provided in said processing chamber; gas introduction means for said plasma generation chamber and said processing chamber; and evacuation means for said plasma generation chamber and said processing chamber; adapted to effect a plasma process on said substrate by selecting a circumferential length L_g of said endless annular wave guide tube, a wavelength λ_g of the microwave in said endless annular wave guide tube, a circumferential length L_s of said dielectric member and a wavelength λ_s of the surface wave propagating in said dielectric member so as to substantially satisfy a relationship:

$$L_s/\lambda_s = (2n+1)L_g/\lambda_g$$

wherein n is 0 or a natural number.

27. (Pending) A microwave processing method according to claim 26, wherein the plasma process is effected under application of a magnetic field.

28. (Pending) A microwave processing method according to claim 27, wherein said magnetic field is so controlled that the magnetic field in a vicinity of the slots is at a magnetic flux density approximately equal to 3.57×10^{-11} (T/Hz) times of a frequency of the microwave.

29. (Pending) A microwave processing method according to claim 26, comprising a step of placing said substrate on said substrate support means at a position distant from a generation area of said plasma.

30. (Pending) A microwave processing method according to claim 26, wherein the plasma process is effected under irradiation of the processed substrate with optical energy.

31. (Pending) A microwave processing method according to claim 30, wherein said optical energy includes ultraviolet light.

32. (Pending) A microwave processing method according to claim 26, wherein the plasma process is effected by supplying high frequency to said support means.

33. (Pending) A microwave processing method according to claim 26, wherein an interior of said wave guide tube is filled with a dielectric material.

34. (Pending) A microwave processing method according to claim 26, wherein an interior of said wave guide tube is filled with a dielectric material which is different from said dielectric member.

35. (Pending) A microwave processing method according to claim 26, wherein said plasma process is film forming.

36. (Pending) A microwave processing method according to claim 26, wherein said plasma process is etching.

37. (Pending) A microwave processing method according to claim 26, wherein said plasma process is ashing.

38. (Pending) A microwave plasma processing method utilizing a microwave plasma processing apparatus comprising a plasma generation chamber whose periphery is separated from ambient air by a dielectric member; microwave introduction means utilizing a cylindrical endless annular wave guide tube provided around said plasma generation chamber and provided with plural slots; a processing chamber connected to said plasma generation chamber; support means for a substrate to be processed, provided in the processing chamber; gas introduction means for said plasma generation chamber and said processing chamber; and evacuation means for said plasma generation chamber and said processing chamber, adapted for effecting a plasma process by selecting a central radius R_g of said endless annular wave guide

tube, a wavelength λ_g of the microwave in said endless annular wave guide tube, a central radius R_s of said dielectric member and a wavelength λ_s of the surface wave propagating in said dielectric member so as to substantially satisfy a relationship:

$R_s/\lambda_s = (2n+1)R_g/\lambda_g$

wherein n is 0 or a natural number.

39. (Pending) A microwave processing method according to claim 38, wherein the plasma process is effected under application of a magnetic field.

40. (Pending) A microwave processing method according to claim 39, wherein said magnetic field is so controlled that the magnetic field in a vicinity of the slots is at a magnetic flux density approximately equal to 3.57×10^{-11} (T/Hz) times of a frequency of the microwave.

41. (Pending) A microwave processing method according to claim 38, comprising a step of placing said substrate on said substrate support means at a position distant from a generation area of said plasma.

42. (Pending) A microwave processing method according to claim 38, wherein the plasma process is effected under irradiation of the processed substrate with optical energy.

43. (Pending) A microwave processing method according to claim 42, wherein said optical energy includes ultraviolet light.

44. (Pending) A microwave processing method according to claim 38, wherein the plasma process is effected by supplying high frequency to said support means.

45. (Pending) A microwave processing method according to claim 38, wherein an interior of said wave guide tube is filled with a dielectric material.

46. (Pending) A microwave processing method according to claim 38, wherein an interior of said wave guide tube is filled with a dielectric material which is different from said dielectric member.

47. (Pending) A microwave processing method according to claim 38, wherein said plasma process is film forming.

48. (Pending) A microwave processing method according to claim 38, wherein said plasma process is etching.

49. (Pending) A microwave processing method according to claim 38, wherein said plasma process is ashing.

50. (Amended) A microwave plasma processing method wherein a substrate is placed in a microwave plasma processing apparatus comprising a plasma generation chamber provided with a first dielectric material; a processing chamber connected to the plasma generation chamber; means for supporting a substrate to be processed, to be placed in the processing chamber; microwave introduction means utilizing an endless annular wave guide provided with plural slots for radiating microwaves therethrough provided outside of said first dielectric material; means for introducing gas for said plasma generation chamber and said processing chamber; and evacuation means for said plasma generation chamber and said processing chamber, wherein the interior of said annular wave guide tube is filled with a second dielectric material which is the same as or different from the first dielectric material, so that the wavelength of microwaves in said wave guide is shortened, thereby effecting a plasma process.

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51. (Pending) A microwave processing method according to claim 50, wherein a ratio of the dielectric constants of said first and second dielectric materials is approximately equal to a reciprocal of a square of a ratio of circumferential lengths of said first and second dielectric materials.

52. (Pending) A microwave processing method according to claim 50, wherein said plasma process is effected under application of a magnetic field.

53. (Pending) A microwave processing method according to claim 52, wherein the magnetic field in a vicinity of the slots has a magnetic flux density approximately equal to 3.57×10^{-11} (T/Hz) times of a frequency of the microwave.

54. (Pending) A microwave processing method according to claim 50, comprising a step of placing said substrate on said substrate support means at a position distant from a generation area of said plasma.

55. (Pending) A microwave processing method according to claim 50, wherein the plasma process is effected under irradiation of the substrate with optical energy.

56. (Pending) A microwave processing method according to claim 50, wherein the plasma process is effected by supplying high frequency to said support means.

57. (Pending) A microwave processing method according to claim 50, wherein said plasma process is film forming.

58. (Pending) A microwave processing method according to claim 50, wherein said plasma process is etching.

59. (Pending) A microwave processing method according to claim 50, wherein said plasma process is ashing.

60. (Amended) A microwave plasma processing apparatus comprising:

a plasma generation chamber provided with a first dielectric material;

means for supporting a substrate to be processed;

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microwave introduction means utilizing an endless annular wave guide with a plurality of slots for radiating microwaves therethrough provided outside of said first dielectric material;

means for introducing gas into said plasma generation chamber; and

evacuation means for said plasma generation chamber;

wherein an interior of said wave guide is filled with a second dielectric material which is the same as or different from said first dielectric material so that the wavelength of microwaves in said wave guide is shortened.

61. (Pending) A microwave processing apparatus according to claim 60, where the wave guide has a cylindrical shape.

62. (Pending) A microwave processing apparatus according to claim 60, where the wave guide has a disk shape.

63. (Pending) A microwave processing apparatus according to claim 60, where the wave guide has a shape which follows the exterior of the first dielectric material.

64. (Pending) A microwave processing apparatus according to claim 60, further comprising a processing chamber connected to said plasma generation chamber.

65. (Pending) A microwave processing apparatus according to claim 64, where the wave guide has a cylindrical shape.

66. (Pending) A microwave processing apparatus according to claim 64, where the wave guide has a disk shape.

67. (Pending) A microwave processing apparatus according to claim 64, where the wave guide has a shape which follows the exterior of the first dielectric material.

68. (Amended) A microwave plasma processing apparatus comprising:

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a plasma generation chamber provided with a first dielectric material;

a substrate support for a substrate to be processed, located inside the plasma generation chamber;

an endless annular wave guide with a plurality of slots for radiating microwaves therethrough provided outside of said first dielectric material;

gas inputs situated to introduce gas into said plasma generation chamber;

an evacuation system situated to permit pressure reduction in said plasma generation chamber;

wherein an interior of said wave guide is filled with a second dielectric material which is the same as or different from said first dielectric material so that the wavelength of microwaves in said wave guide is shortened..

C4 Cont

69. (Pending) A microwave processing apparatus according to claim 68, where the wave guide has a cylindrical shape.

70. (Pending) A microwave processing apparatus according to claim 68, where the wave guide has a disk shape.

71. (Pending) A microwave processing apparatus according to claim 68, where the wave guide has a shape which follows the exterior of the first dielectric material.

72. (Pending) A microwave processing apparatus according to any one of claims 60-71, wherein a ratio of dielectric constants of said first and second dielectric materials is approximately equal to a reciprocal of a square of the ratio of circumferential lengths of said first and second dielectric materials.

73. (Pending) A microwave processing apparatus according to any one of claims 60-71, further comprising a magnetic field generator.

74. (Pending) A microwave processing apparatus according to claim 73, wherein the magnetic field in the vicinity of the slots has a magnetic flux density approximately equal to 3.57×10^{-11} (T/Hz) times of a frequency of the microwave.

75. (Pending) A microwave processing apparatus according to any one of claims 60-71, wherein said substrate support is provided at a position distant from a generation area of said plasma.

76. (Pending) A microwave processing apparatus according to any one of claims 60-71, further comprising an optical energy source to irradiate the substrate.

77. (Pending) A microwave processing apparatus according to any one of claims 60-71, further comprising a high frequency supply connected to said substrate support.

C5

78. (Amended) A microwave plasma processing method wherein a substrate is placed in a microwave plasma processing apparatus comprising a plasma generation provided with a first dielectric material; means for supporting a substrate to be processed; microwave introduction means utilizing an endless annular wave guide provided outside of said plasma generation chamber and provided with plural slots for irradiating microwaves therethrough; means for introducing gas for said plasma generation chamber; and evacuation means for said plasma generation chamber, wherein the interior of said wave guide is filled with a second

C5 Gnt SubB

dielectric material which is the same as or different from the first dielectric material, so that the wavelength of microwaves in said wave guide is shortened, thereby effecting a plasma process.

79. (Pending) A microwave plasma processing method according to claim 78, wherein the microwaves are introduced utilizing a cylindrically-shaped wave guide.

80. (Pending) A microwave plasma processing method according to claim 78, wherein the microwaves are introduced utilizing a disk-shaped wave guide.

81. (Pending) A microwave plasma processing method according to claim 78, wherein the microwaves are introduced utilizing a waveguide which has a shape which follows the exterior of the first dielectric material.

82. (Pending) A microwave plasma processing method according to claim 78, further comprising using a processing chamber connected to said plasma generation chamber.

83. (Pending) A microwave plasma processing method according to claim 82, wherein the microwaves are introduced utilizing a cylindrically-shaped wave guide.

84. (Pending) A microwave plasma processing method according to claim 82, wherein the microwaves are introduced utilizing a disk-shaped wave guide.

85. (Pending) A microwave plasma processing method according to claim 82, wherein the microwaves are introduced utilizing a waveguide which has a shape which follows the exterior of the first dielectric material.

C6

~~86. (Amended) A microwave plasma processing method wherein a substrate is placed in a microwave plasma processing apparatus comprising a plasma generation chamber provided with a first dielectric material; a substrate support for the substrate to be processed; an endless annular wave guide provided outside of said plasma generation chamber and provided with plural slots for irradiating microwaves therethrough; gas inputs to introduce gas into said plasma generation chamber; and an evacuation system situated to permit pressure reduction in said plasma generation chamber, wherein the interior of said wave guide is filled with a second dielectric material which is the same as or different from the first dielectric material, so that the wavelength of microwaves in said wave guide is shortened, thereby effecting a plasma process.~~

87. (Pending) A microwave plasma processing method according to claim 86, wherein the microwaves are introduced utilizing a cylindrically-shaped wave guide.

88. (Pending) A microwave plasma processing method according to claim 86, wherein the microwaves are introduced utilizing a disk-shaped wave guide.

89. (Pending) A microwave plasma processing method according to claim 86, wherein the microwaves are introduced utilizing a waveguide which has a shape which follows the exterior of the first dielectric material.

90. (Pending) A microwave processing method according to any one of claims 78-89, wherein a ratio of the dielectric constants of said first and second dielectric materials is approximately equal to a reciprocal of a square of a ratio of circumferential lengths of said first and second dielectric materials.

91. (Pending) A microwave processing method according to any one of claims 78-89, wherein said plasma process is effected under application of a magnetic field.

92. (Pending) A microwave processing method according to claim 91, wherein the magnetic field in a vicinity of the slots has a magnetic flux density approximately equal to 3.57×10^{-11} (T/Hz) times of a frequency of the microwave.

93. (Pending) A microwave processing method according to any one of claims 78-89, comprising a step of placing said substrate on said substrate support at a position distant from a generation area of said plasma.

94. (Pending) A microwave processing method according to any one of claims 78-89, wherein the plasma process is effected under irradiation of the substrate with optical energy.

95. (Pending) A microwave processing method according to any one of claims 78-89, wherein the plasma process is effected by supplying high frequency to said support means.

96. (Pending) A microwave processing method according to any one of claims 78-89, wherein said plasma process is film forming.

97. (Pending) A microwave processing method according to any one of claims 78-89, wherein said plasma process is etching.

98. (Pending) A microwave processing method according to any one of claims 78-89, wherein said plasma process is ashing.

C7

99. (New) A microwave plasma processing apparatus according to claim 19, wherein a spacing between selected slots of said plurality of slots is one half of a guide wavelength of microwaves in said annular waveguide.

100. (New) A microwave plasma processing apparatus according to claim 99, wherein adjacent slots of said plurality of slots are at a spacing of one half or one quarter of a guide wavelength of microwaves in said annular waveguide.

101. (New) A microwave processing apparatus according to claim 60, wherein a spacing between selected slots of said plurality of slots is one half of a guide wavelength of microwaves in said annular waveguide.

102. (New) A microwave plasma processing apparatus according to claim 101, wherein adjacent slots of said plurality of slots are at a spacing of one half or one quarter of a guide wavelength of microwaves in said annular waveguide.

C7 cont

103. (New) A microwave processing apparatus according to claim 68, wherein a spacing between selected slots of said plurality of slots is one half of a guide wavelength of microwaves in said annular waveguide.

104. (New) A microwave plasma processing apparatus according to claim 103, wherein adjacent slots of said plurality of slots are at a spacing of one half or one quarter of a guide wavelength of microwaves in said annular waveguide.

105. (New) A microwave plasma processing method according to claim 78, wherein a spacing between selected slots of said plurality of slots is one half of a guide wavelength of microwaves in said annular waveguide.

106. (New) A microwave plasma processing method according to claim 105, wherein adjacent slots of said plurality of slots are at a spacing of one half or one quarter of a guide wavelength of microwaves in said annular waveguide.

107. (New) A microwave plasma processing method according to claim 86, wherein a spacing between selected slots of said plurality of slots is one half of a guide wavelength of microwaves in said annular waveguide.

C7 cont

108. (New) A microwave plasma processing method according to claim 107, wherein adjacent slots of said plurality of slots are at a spacing of one half or one quarter of a guide wavelength of microwaves in said annular waveguide.

109. (New) A microwave plasma processing method according to claim 50, wherein a spacing between selected slots of said plurality of slots is one half of a guide wavelength of microwaves in said annular waveguide.

110. (New) A microwave plasma processing method according to claim 108, wherein adjacent slots of said plurality of slots are at a spacing of one half or one quarter of a guide wavelength of microwaves in said annular waveguide.